

WHAT IS CLAIMED IS:

1. A system of remotely detecting and locating damaged conductors, said system comprising:
 - at least one slave controller disposed proximate at least one load and
 - 5 electrically connected to the at least one load via at least one conductor, wherein the at least one slave controller comprises:
 - at least one solid-state switch capable of controllably altering the input current to the at least one load; and
 - at least one measuring element for measuring at least one parameter
 - 10 associated with the at least one load and the at least one solid-state switch, wherein said solid-state switch controllably alters the input current to the at least one load according to the at least one parameter; and
 - at least one damaged wire detector electrically connected to the at least one conductor between the at least one slave controller and the at least one load, wherein
 - 15 the at least one damaged wire detector is capable of at least one of detecting and locating at least one damaged conductor.
2. A system according to Claim 1, wherein each damaged wire detector is capable of notifying a respective slave controller when the damaged wire detector
- 20 detects a damaged conductor such that the at least one solid-state switch of the respective slave controller can alter the input current to the at least one load.
3. A system according to Claim 1, wherein the at least one solid-state switch operates in at least one mode selected from a group consisting of an on mode
- 25 wherein the at least one solid-state switch permits a respective load to receive the input current, and an off mode wherein the at least one solid-state switch prevents the respective load from receiving the input current, and wherein when the at least one solid-state switch operates in the off mode the at least one damaged wire detector is capable of testing the at least one conductor to thereby at least one of detect and locate
- 30 at least one damaged conductor before the at least one solid-state switch is placed in the on mode.
4. A system according to Claim 1, wherein each damaged wire detector is capable of at least one of detecting and locating at least one damaged conductor by:

transmitting at least one test pulse along at least one respective conductor and receiving at least one reflection from the at least one respective conductor; and comparing the at least one reflection to reference data to thereby at least one of detect and locate at least one damaged conductor.

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5. A system according to Claim 4, wherein each damaged wire detector is further capable of converting the at least one reflection to digital data representative of the at least one reflection, and wherein each damaged wire detector is capable of comparing the at least one reflection to reference data by comparing the digital data to the reference data.

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6. A system according to Claim 5, wherein each damaged wire detector is capable of converting the at least one reflection to digital data with at least one resolution.

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7. A system according to Claim 4, wherein each damaged wire detector is further capable of determining at least one length of the at least one conductor based upon at least one transit time between transmission of the at least one test pulse and reception of the respective at least one reflection, and wherein each damaged wire detector is capable of comparing the at least one reflection to reference data by comparing the at least one determined length to at least one reference length.

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8. A system according to Claim 7, wherein each damaged wire detector is capable of comparing the at least one determined length to the at least one reference length includes detecting at least one damaged conductor when the at least one determined length is shorter than the respective at least one reference length by at least a threshold length, and wherein each damaged wire detector is capable of locating the damage as a point on the respective at least one conductor at the at least one determined length.

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9. A method of remotely detecting and locating damaged conductors comprising:

configuring a processing element that controls input current through at least one switch to at least one load via at least one conductor, wherein the configuring is

based upon at least one characteristic selected from a group consisting of a current rating of each load, a voltage rating of each load, a maximum current rating of each switch and a temperature rating of each switch;

operating each switch in an off mode wherein each switch prevents the input
5 current from flowing to a respective load;

testing the at least one conductor to thereby at least one of detect and locate at least one damaged conductor;

operating each switch in an on mode wherein each switch permits the input current from flowing to a respective load when no damaged conductors are detected,
10 and thereafter controlling the input current to the at least one load, wherein controlling the input current comprises:

monitoring at least one parameter associated with each switch and respective load selected from a group consisting of the input current to the load, a voltage drop across the load, the input current through the switch and a
15 temperature of the switch;

determining a condition of each switch and respective load depending upon at least one of the at least one characteristic and the at least one parameter; and

operating each switch in at least one mode selected from a group
20 consisting of the on mode and the off mode depending upon the condition of the respective loads.

10. A method according to Claim 9, wherein testing the at least one conductor comprises:

25 transmitting at least one test pulse along at least one respective conductor and receiving at least one reflection from the at least one respective conductor; and

comparing the at least one reflection to reference data to thereby at least one of detect and locate at least one damaged conductor.

30 11. A method according to Claim 10, wherein testing the at least one conductor further comprises converting the at least one reflection to digital data representative of the at least one reflection, and wherein comparing the at least one reflection to reference data comprises comparing the digital data to the reference data.

12. A method according to Claim 11, wherein converting the at least one reflection comprises converting the at least one reflection to digital data with at least one resolution.

5 13. A method according to Claim 10, wherein testing the at least one conductor further comprises determining at least one length of the at least one conductor based upon at least one transit time between transmission of the at least one test pulse and reception of the respective at least one reflection, wherein comparing the at least one reflection to reference data comprises comparing the at least one
10 determined length to at least one reference length.

 14. A method according to Claim 13, wherein comparing the at least one determined length to the at least one reference length comprises detecting at least one damaged conductor when the at least one determined length shorter than the
15 respective at least one reference length by more than a threshold length, and wherein locating the at least one damaged conductor comprises locating a point on the respective at least one conductor at the at least one determined length.

 15. A system of remotely detecting and locating damaged conductors, said
20 system comprising:

 at least one load;

 at least one slave controller disposed proximate, and electrically connected to, at least one load, wherein the at least one slave controller is capable of measuring at least one parameter associated with the at least one load, and wherein the at least one
25 slave controller is capable of controllably altering the input current to the at least one load according to the at least one parameter; and

 at least one damaged wire detector electrically connected between the at least one slave controller and the at least one load, wherein the at least one damaged wire detector is capable of at least one of detecting and locating at least one damaged
30 conductor through which input current is delivered to the at least one load.

 16. A system according to Claim 15, wherein each damaged wire detector is capable of notifying a respective slave controller when the damaged wire detector

detects a damaged conductor such that the respective slave controller can alter the input current to the at least one load.

17. A system according to Claim 15, wherein the at least one slave
5 controller operates in at least one mode selected from a group consisting of an on mode wherein the at least one slave controller permits a respective load to receive the input current, and an off mode wherein the at least one slave controller prevents the respective load from receiving the input current, and wherein when the at least one slave controller operates in the off mode the at least one damaged wire detector is
10 capable of testing the at least one conductor to thereby at least one of detect and locate at least one damaged conductor before the at least one slave controller is placed in the on mode.

18. A system according to Claim 15, wherein each damaged wire detector
15 is capable of at least one of detecting and locating at least one damaged conductor by:
transmitting at least one test pulse along at least one respective conductor and receiving at least one reflection from the at least one respective conductor; and
comparing the at least one reflection to reference data to thereby at least one of detect and locate at least one damaged conductor.

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19. A system according to Claim 18, wherein each damaged wire detector is further capable of converting the at least one reflection to digital data representative of the at least one reflection, and wherein each damaged wire detector is capable of comparing the at least one reflection to reference data by comparing the
25 digital data to the reference data.

20. A system according to Claim 19, wherein each damaged wire detector is capable of converting the at least one reflection to digital data with at least one resolution.

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21. A system according to Claim 18, wherein each damaged wire detector is further capable of determining at least one length of the at least one conductor based upon at least one transit time between transmission of the at least one test pulse and reception of the respective at least one reflection, and wherein each damaged wire

detector is capable of comparing the at least one reflection to reference data by comparing the at least one determined length to at least one reference length.

22. A system according to Claim 21, wherein each damaged wire detector
5 is capable of comparing the at least one determined length to the at least one reference
length includes detecting at least one damaged conductor when the at least one
determined length is shorter than the respective at least one reference length by at
least a threshold length, and wherein each damaged wire detector is capable of
locating the damage as a point on the respective at least one conductor at the at least
10 one determined length.